

WS 1.6 Dimensional Analysis (CONVERSIONS)

This may be the most important worksheet of the semester.

example A: 29.5 in \rightarrow ft: $29.5 \cancel{\text{in}} \times \frac{1 \text{ ft}}{12 \cancel{\text{in}}} = 2.46 \text{ ft}$

example B: 0.036 m \rightarrow in: $0.036 \cancel{\text{m}} \times \frac{100 \cancel{\text{cm}}}{1 \cancel{\text{m}}} \times \frac{1 \text{ in}}{2.54 \cancel{\text{cm}}} = 1.4 \text{ in}$

1) 2.45 ft \rightarrow mi $2.45 \text{ ft} \left(\frac{1 \text{ mi}}{5280 \text{ ft}} \right) = 4.64 \times 10^{-4} \text{ mi}$

2) 75.0 kg \rightarrow lb $75.0 \text{ kg} \left(\frac{2.2 \text{ lb}}{1 \text{ kg}} \right) = 165 \text{ lb}$

3) 10.0 gal \rightarrow mL $10.0 \text{ gal} \left(\frac{4 \text{ qt}}{1 \text{ gal}} \right) \left(\frac{1 \text{ L}}{1.057 \text{ qt}} \right) \left(\frac{1000 \text{ mL}}{1 \text{ L}} \right) = 37,800 \text{ mL}$

4) 89 km \rightarrow in $89 \text{ km} \left(\frac{1000 \text{ m}}{1 \text{ km}} \right) \left(\frac{100 \text{ cm}}{1 \text{ m}} \right) \left(\frac{1 \text{ in}}{2.54 \text{ cm}} \right) = 3.5 \times 10^6 \text{ in}$

example C: 5.17 lb/gal \rightarrow lb/qt: $5.17 \frac{\text{lb}}{\text{gal}} \times \frac{1 \text{ qt}}{4 \text{ gal}} = 1.29 \text{ lb/qt}$

example D: 3.4 mi/hr \rightarrow km/min $3.4 \frac{\text{mi}}{\text{hr}} \times \frac{1.61 \text{ km}}{1 \text{ mi}} \times \frac{1 \text{ hr}}{60 \text{ min}} = 9.1 \times 10^{-2} \text{ km/min}$

5) 459 ft/sec \rightarrow mi/hr $459 \frac{\text{ft}}{\text{sec}} \left(\frac{1 \text{ mi}}{5280 \text{ ft}} \right) \left(\frac{60 \text{ sec}}{1 \text{ min}} \right) \left(\frac{60 \text{ min}}{1 \text{ hr}} \right) = 313 \text{ mi/hr}$

6) 2.40 g/mL \rightarrow lb/gal $2.40 \frac{\text{g}}{\text{mL}} \left(\frac{4 \text{ lb}}{454 \text{ g}} \right) \left(\frac{1000 \text{ mL}}{1 \text{ L}} \right) \left(\frac{1 \text{ L}}{1.057 \text{ qt}} \right) \left(\frac{4 \text{ qt}}{1 \text{ gal}} \right) = 20.0 \text{ lb/gal}$

7) 32.56 km/hr \rightarrow ft/hr $32.56 \text{ km} \left(\frac{1 \text{ mi}}{1.61 \text{ km}} \right) \left(\frac{5280 \text{ ft}}{1 \text{ mi}} \right) = 106,800 \text{ ft/hr}$

example E: 3.9 cm³ \rightarrow ft³ $3.9 \text{ cm}^3 \times \left(\frac{1 \cancel{\text{in}}}{2.54 \cancel{\text{cm}}} \right)^3 \times \left(\frac{1 \cancel{\text{ft}}}{12 \cancel{\text{in}}} \right)^3 = 1.4 \times 10^{-4} \text{ ft}^3$

8) 5800 mi² \rightarrow km² $5800 \text{ mi}^2 \left(\frac{1.61 \text{ km}}{1 \text{ mi}} \right)^2 = 15,000 \text{ km}^2$

9) 35.2 ft² \rightarrow cm² $35.2 \text{ ft}^2 \left(\frac{12 \text{ in}}{1 \text{ ft}} \right)^2 \left(\frac{2.54 \text{ cm}}{1 \text{ in}} \right)^2 = 30,200 \text{ cm}^2$

1 ft = 12 in
1 mi = 5280 ft
1 lb = 16 oz
1 gal = 4 qt

1 in = 2.54 cm
1 mi = 1.61 km
1 lb = 454 g
1 L = 1.057 qt

1 m = 100 cm
1 km = 1000 m
1 kg = 1000 g
1 L = 1000 mL
1 mL = 1 cm³

ANS (IRO+2): 0.000464 165 107,000 22.4 32,700 15,000 313 220. 3,500,000 20.0
37,800

UNITS (IRO+2): km² mL lb/gal mi ft/hr cm² in mi/hr lb kg lb/ft³

Practice Problems

Factor Label Problem Solving

Name: _____

The following equalities might be necessary in some of the problems on this worksheet.

$$2.54 \text{ cm} = 1.00 \text{ in}$$

$$454 \text{ g} = 1.00 \text{ lb}$$

$$1.00 \text{ Angstrom (A}^\circ\text{)} = 1 \times 10^{-8} \text{ cm}$$

$$3 \text{ ft} = 1 \text{ yard}$$

$$12 \text{ inches} = 1 \text{ ft}$$

Please SHOW ALL WORK using the factor label method!!!! Do not forget units!!!!

1. How many dimes are in 56 dollars? How many pennies? (ans. = 5600 pennies)

$$56.00 \left(\frac{10 \text{ dimes}}{\$1.00} \right) = 560.0 \text{ dimes} \quad 56.00 \left(\frac{100 \text{ p}}{\$1.00} \right) = 5600 \text{ pennies}$$

2. How many nickels are there in 6 quarters? (ans. = 30 nickels)

$$6 \text{ quarters} \left(\frac{5 \text{ nickels}}{1 \text{ quarter}} \right) = 30 \text{ nickels}$$

3. How many hours, minutes and seconds are in 3 weeks? (ans. = 504 hrs, 30240 min, 1814400 sec)

$$3 \text{ wks} \left(\frac{7 \text{ day}}{1 \text{ wk}} \right) \left(\frac{24 \text{ hr}}{1 \text{ day}} \right) \left(\frac{60 \text{ min}}{1 \text{ hr}} \right) \left(\frac{60 \text{ s}}{1 \text{ min}} \right) = 1814400 \text{ min}$$

$\xrightarrow{504 \text{ hrs}} \xrightarrow{30240 \text{ min}}$

4. Convert 17 pounds to grams. (ans. = $7.7 \times 10^3 \text{ g}$)

$$17 \text{ lbs} \left(\frac{1 \text{ kg}}{2.2 \text{ lb}} \right) \left(\frac{1000 \text{ g}}{1 \text{ kg}} \right) = 0.0077 \text{ g or } 7.7 \times 10^{-3} \text{ g}$$

5. How many centimeters are in 254 inches? (ans. = 645 cm)

$$254 \text{ in} \left(\frac{2.54 \text{ cm}}{1 \text{ in}} \right) = 645 \text{ cm}$$

6. 50.0 yards contain how many feet? (ans. = 150 ft)

$$50.0 \text{ yd} \left(\frac{3 \text{ ft}}{1 \text{ yd}} \right) = 150 \text{ ft}$$

7. Convert 540 mm to kilometers. (ans. = $5.40 \times 10^{-4} \text{ km}$)

$$540 \text{ mm} \left(\frac{1 \text{ km}}{1 \times 10^6 \text{ mm}} \right) = 5.4 \times 10^{-4} \text{ km}$$

8. How many centimeters are there in 2.0 feet? (ans. = 61 cm)

$$2.0 \text{ ft} \left(\frac{12 \text{ in}}{1 \text{ ft}} \right) \left(\frac{2.54 \text{ cm}}{1 \text{ in}} \right) = 61 \text{ cm}$$

9. Convert 150 feet to Angstroms. (ans. = $4.57 \times 10^{11} \text{ A}^\circ$)

$$150 \text{ ft} \left(\frac{12 \text{ in}}{1 \text{ ft}} \right) \left(\frac{2.54 \text{ cm}}{1 \text{ in}} \right) \left(\frac{1 \text{ A}^\circ}{1 \times 10^{-8} \text{ cm}} \right) = 4.6 \times 10^{11} \text{ A}^\circ$$